

A-MAZE-ing Treatment for Atrial Fibrillation

Lakeshore Cardiothoracic and Vascular Surgery Offers Surgical Option

By Jan Andersen

Patients may not even know they have this disorder — that is, until they end up in the doctor's office or the hospital with a major medical emergency. The disorder is atrial fibrillation, or AF, and although it is not deadly on its own, its downstream effects can be.

"Atrial fibrillation is basically an abnormality of the electrical system of the heart," says Dr. Kourosh Baghelai from Lakeshore Cardiothoracic and Vascular Surgery in St. Joseph. He and his partner, Dr. Frederick Levine, also are on staff in the Department of General Surgery at Lakeland Regional Health System.

"In layman's terms," Dr. Baghelai says, "AF is a relatively subtle condition, where the electrical function in the atrium goes awry. You develop a rapid,

irregular rhythm in which you lose the atrial pumping function. Under normal conditions, the atrium contributes about 10 percent – 15 percent of the heart's overall blood flow. When you go into fibrillation you lose that, along with the pumping efficiency of the heart."

CAUSES AND SYMPTOMS

According to the American Heart Association, AF is found in about 2.2 million Americans. Three to five percent of people over age 65 have it, making it the most common of all sustained cardiac arrhythmias.

The most common cause of atrial fibrillation appears to be aging. The risk of AF increases as areas of scarring or fibrosis develop in atrial tissue as a result of "wear and tear." Abnormalities of the heart valves, most often the mitral valve, also can lead to AF.

Although considered by many to be an innocuous arrhythmia, AF is associated with significant morbidity and mortality. Dr. Baghelai explains, "First, the irregular heartbeat can cause patients considerable discomfort and anxiety. Second, the loss of synchronous atrioventricular contraction can compromise cardiac function. But the more common long-term problem is that people with AF are at significantly increased risk for forming clots in their heart due to blood stagnation. If this happens, the clots can go anywhere. Half of them end up in the brain, causing strokes.

"The most dangerous form," he says, "is paroxysmal AF. With this condition, patients spend some time in AF and then spontaneously go into regular rhythm. It's like loading and firing a gun. During fibrillation the blood stagnates and clots. Then, when the patient reverts to normal rhythm, the 'gun fires.' The blood starts moving correctly through the atrium, potentially carrying throughout the system clots that were formed during the episode of AF."

According to Dr. Baghelai, AF can present in a variety of ways. "The first time some people notice it is when they have a stroke or an embolism somewhere unrelated to the heart. It can also present as heart palpitations. Others present with shortness of breath, and during the workup it's discovered they're in AF. So it can range from no symptoms, to a devastating emergency. On its own, AF is not



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Kourosh Baghelai, MD, and Frederick Levine, MD, are cardiothoracic surgeons who practice at Lakeshore Cardiothoracic and Vascular Surgery in St. Joseph. Both physicians are also on staff in the Department of General Surgery at Lakeland Regional Health System in St. Joseph, MI.

fatal, unless the heart rate accelerates into a life-threatening arrhythmia or a clot is thrown into a coronary artery. But that is uncommon.”

TREATMENT OPTIONS

There are several treatment options for AF: (1) The optimal noninvasive treatment includes the use of drugs directed toward rhythm control, to convert AF to normal sinus rhythm. (2) There also are drugs designed for rate control — to slow the rate of ventricular response to AF. However, with these the atria are still fibrillating and the potential problems associated with AF still exist. (3) In addition, anticoagulatory medications may be used to help prevent the formation of emboli in the heart. However, the risk of life-threatening bleeding goes up with these drugs, especially in older people — the population with the highest incidence of AF. (4) Electrical cardioversion may be used to restore normal heart rhythm. Or (5) an atrial pacemaker can be implanted.

Although each of these treatments is effective for some patients, the risk of side effects is comparatively high, and they may not work long-term. This has led to the search for a more permanent solution.

THE SURGICAL ALTERNATIVE

That solution has been found in surgery — more specifically, the Cox–MAZE III operation. Also known as the MAZE procedure, it is the gold standard for surgical treatment and has proven to be the most effective therapy for AF yet devised.

The MAZE procedure can be performed on both the left and right atriums. Dr. Baghelai describes the process. “It was originally developed about a decade ago by Dr. James Cox. To understand the surgery, you need to understand what is occurring electrically with AF. Within the atrium wall muscle, the electricity that triggers a contraction of the heart starts going around in a circle — like a little tornado. This initiates a larger circuit where several little tornados create a hurricane of electrical impulses. It is this circular motion that interferes with the normal contraction of the heart, disrupting the orderly pathways through which the electricity travels. When this abnormal circular motion of electricity takes place, the atrial rhythm becomes irregular and leads to AF.

“What Dr. Cox envisioned,” Dr. Baghelai continues, “is a way to stop this circular pattern from being generated. To do this, he created a maze — like the maze a mouse goes through — to force the electricity down only one path. The electricity has to travel this new, convoluted path; there is only one way it can go from the SA node to the AV node. No irregular circular motion can be established, so the atrium no longer fibrillates, and normal sinus rhythm is restored.”

The way Dr. Cox initially created this maze was by cutting the atrium wall and sewing it back together in a particular pattern, taking advantage of



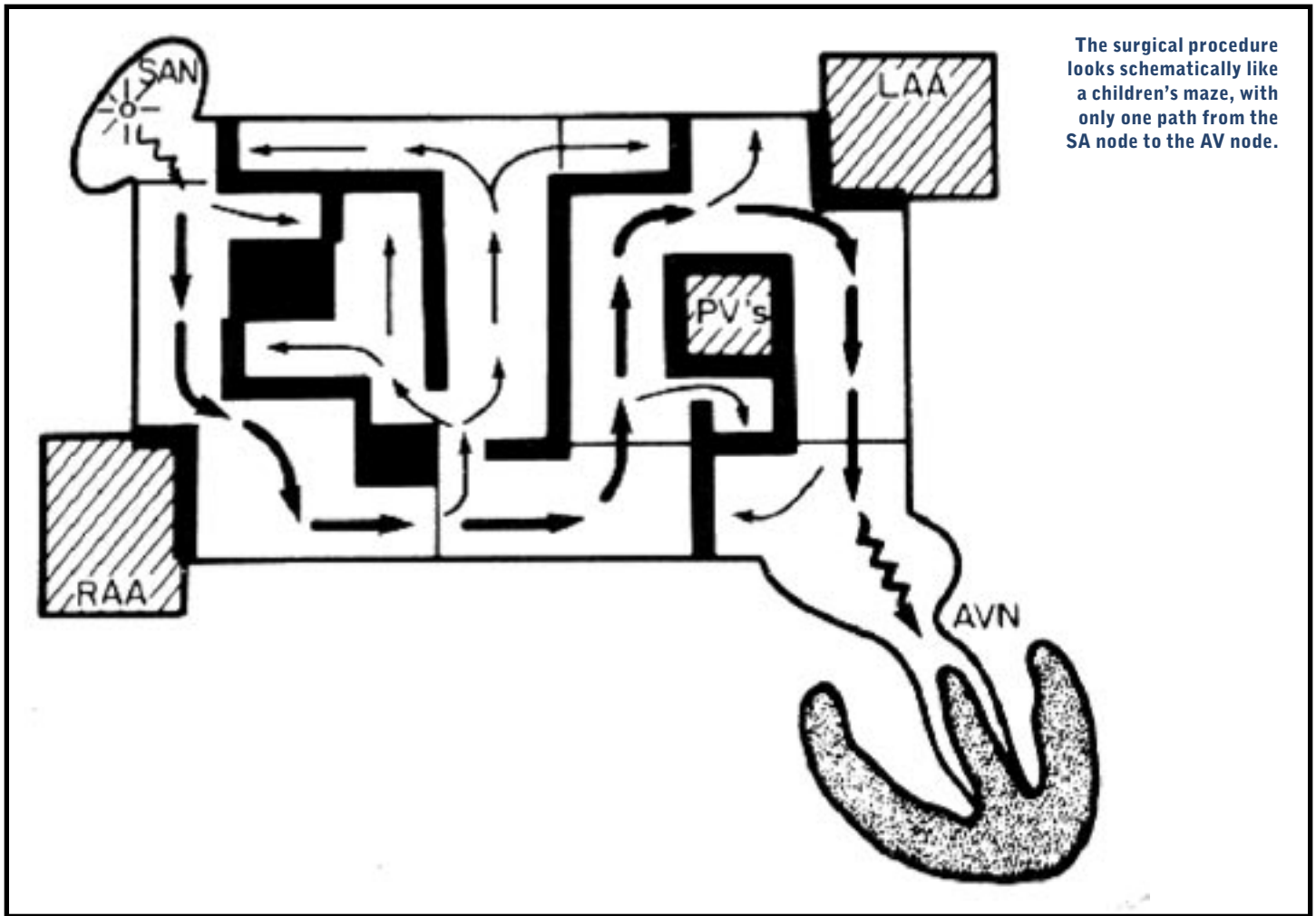
Dr. Baghelai is able to perform procedures such as the MAZE in a more timely manner with the help of a surgical ablation system.

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the fact that a cut that heals cannot effectively conduct electricity. Although it eliminated AF in at least 90 percent of the patients who underwent the surgery, it was a very involved operation. It took a lot of time, and there was a fair amount of risk to the procedure.

Dr. Baghelai says, “About five years ago, new approaches became available. We can interrupt the electrical conduction in the atrium wall by means other than cutting and sewing. New technologies for creating the maze include radiofrequency (RF) ablation, microwaves, ultrasound, cryotherapy and lasers. Either heat or cold will disrupt electrical conduction in the wall almost as well as a physical cut.

“This has reduced the time necessary to do this procedure to less than 15 minutes,” he states. “So now, if you already have the chest open and you’re doing a valve replacement or a bypass procedure, to include MAZE is another



The surgical procedure looks schematically like a children's maze, with only one path from the SA node to the AV node.

10 – 15 minutes with essentially no added risk beyond the baseline hazards of having a heart operation.”

Because MAZE is an open-heart procedure requiring cardiopulmonary bypass on a heart/lung machine, it carries risk of stroke, kidney failure, other organ failure and death. Each patient needs to be evaluated carefully for appropriateness. Some patients require a permanent pacemaker postoperatively (thought to be due to underlying disease of the SA node rather than the procedure itself). Success rates vary, but newer versions of the MAZE procedure are highly effective in restoring normal sinus rhythm — reported to be in the range of 80 – 100 percent.

LOOKING AHEAD

Both Dr. Baghelai and Dr. Levine perform the MAZE procedure at Lakeland Regional Health System. They primarily use the radiofrequency ablation approach. Although this is less complicated than the original “cut and sew” method, it is still a major operation. Dr. Baghelai says, “At this point, we don’t do the MAZE procedure if the only reason for surgery is to get someone out of AF. The surgery is done through a median sternotomy, so it’s relatively high-risk, if that’s all you’re going to do. We use it as an adjunct — something that is very helpful to an AF patient who is having cardiac surgery for another reason.”

Dr. Baghelai believes this is going to change soon, however. “It’s essentially a technological barrier. Minimally invasive procedures are under development, and they will eliminate having to open the chest. But none of them

have been worked out to the point where they’re easily reproducible.

“In the meantime,” he concludes, “if you have a patient who needs any form of cardiac surgery and has AF, you should definitely ask the specialist you’re referring to about the MAZE procedure. Unless there is some contraindication, I believe MAZE should be offered to all patients who have a history of AF and are undergoing cardiac surgery. It can make a significant difference in their lives and their long-term health.”

Kourosh Baghelai, MD, practices at Lakeshore Cardiothoracic and Vascular Surgery, and is a staff member in the Department of General Surgery at Lakeland Regional Health System in St. Joseph, MI. Board-certified in general surgery and board eligible in cardiothoracic surgery, Dr. Baghelai received his medical degree from the University of Maryland School of Medicine in Baltimore. He completed a fellowship in general thoracic surgery at the Hospital of the University of Pennsylvania and a cardiothoracic fellowship at Hahnemann University Hospital in Philadelphia. ■

For More Information

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